



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference F18306 SCF | | FOR FURTHER ACTION | | See Form PCT/PEA/418 |
| International application No. PCT/IB2004/003196 | | International filing date (day/month/year) 30.09.2004 | | Priority date (day/month/year) 03.10.2003 |
| International Patent Classification (IPC) or national classification and IPC F42D1/08 | | | | |
| Applicant INTERNATIONAL TECHNOLOGIES, LLC et Al. | | | | |
| <p>1. This report is the International preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 38.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 5 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in Item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 602 of the Administrative Instructions).</p> | | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | | |
| Date of submission of the demand 02.08.2005 | | Date of completion of this report 15.12.2005 | | |
| Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 551 epo nl Fax: +31 70 340 - 3016 | | Authorized Officer Lostetter, Y Telephone No. +31 70 340-1098  | | |

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**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

IAP20 Rec'd PCT/PTO 03 APR 2006
International application No.
PCT/IB2004/003196

Box No. 1 Basis of the report

1. With regard to the language, this report is based on the International application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements* of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-9 as originally filed

Claims, Numbers

1-22 filed with telefax on 05.09.2005

Drawings, Sheets

1/2, 2/2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
 4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/B2004/003198

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

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|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | 1-22 |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | 1-22 |
| | No: Claims | |
| Industrial applicability (IA) | Yes: Claims | 1-22 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/IB2004/003196

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: DE-B-1278908

D2: WO-A-02/42711

2. The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (column 2, lines 19-30; column 3, lines 1-24; figure 1; the references in parentheses applying to this document):

A method of charging and blasting a drill hole (1) extending between a mouth thereof at a surface, and a blind end or bottom thereof remote from the mouth,

- the method steps of charging the drill hole including:

- providing in the drill hole (1) at a relatively low level toward said bottom a lower layer (2) of a blasting substance, and a lower layer of a plunger material (3) proximately above the lower layer (2) of blasting substance;
- providing in the drill hole (1) at a relatively high level remote from said bottom a higher layer of a *blasting substance* (2'), spaced a predetermined distance above said lower layer of plunger material (3) to form a spacing (6'), and proximately above said higher layer of a *blasting substance* (2'), a higher layer of *plunger material* (3');
- placing Initiators (4) in association with the respective layers of blasting substances (2, 2') and connecting the initiators (4) to a controller (7) for actuating the initiators (4) at predetermined time intervals;

- the method steps of blasting the charged drill hole (1) including actuating the initiators (4) by means of the controller (7).

The subject-matter of claim 1 therefore differs from this known method in that:

- the higher layer of plunger material is located below the higher layer of a blasting substance;
- the method steps of blasting the charged drill hole further including propelling the

lower layer of plunger material by means of the lower layer of blasting substance into the spacing, and propelling the higher layer of plunger material by means of the higher layer of blasting substance into said spacing; thereby causing the lower layer of plunger material and the higher layer of plunger material to impinge upon each other, and causing conversion of kinetic energy associated with the propelled layers of plunger material into pressure or shock waves to effect destruction of rock in the surrounding material.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as reducing the amount of explosives required to conduct blasting operations.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reason: Although the feature of providing a layer of plunger material below a layer of blasting substance, which layer of plunger material is forced downwards at a high velocity upon detonation of the blasting substance is described in document D2 (cf. page 9, line 25 - page 10, line 16), the skilled person would not regard it as a normal design option to locate the higher layer of plunger material below the higher layer of blasting substance in the drill hole arrangement described in document D1 in order to solve the problem posed because the feature of causing the lower layer of plunger material and the higher layer of plunger material to impinge upon each other is not disclosed nor suggested in document D2, nor in any of the documents cited in the international search report.

3. The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding Independent claims 12, 13 and 22, which therefore are also considered new and inventive.
4. Claims 2-11 and 14-21 are dependent on claims 1 and 13 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

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CLAIMS:

1. A method of charging and blasting a drill hole extending between a
5 mouth thereof at a surface, and a blind end or bottom thereof remote from the
mouth, the method steps of charging the drill hole including
providing in the drill hole at a relatively low level toward said bottom a
lower layer of a blasting substance, and a lower layer of a plunger material
proximately above the lower layer of blasting substance;
10 providing in the drill hole at a relatively high level remote from said
bottom a higher layer of a plunger material, spaced a predetermined distance
above said lower layer of plunger material to form a spacing, and proximately
above said higher layer of plunger material, a higher layer of a blasting
substance;
15 placing initiators in association with the respective layers of blasting
substances and connecting the initiators to a controller for actuating the
initiators at predetermined time interval,
the method steps of blasting the charged drill hole including
actuating the initiators by means of the controller, thereby propelling the
20 lower layer of plunger material by means of the lower layer of blasting
substance into said spacing, and propelling the higher layer of plunger material
by means of the higher layer of blasting substance into said spacing; thereby
causing the lower layer of plunger material and the higher layer of plunger
material to impinge upon each other, and causing conversion of kinetic energy
25 associated with the propelled layers of plunger material into pressure or shock
waves to effect destruction of rock in the surrounding material.
2. A method as claimed in Claim 1, in which the spacing between
opposing surfaces of respectively said lower layer of plunger material and said
30 higher layer of plunger material is between about 0.5 m and about 3 m.

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3. A method as claimed in Claim 1 or Claim 2 in which the respective layers of plunger material are flowable material allowing placement in the drill hole at the respective desired positions.
- 5 4. A method as claimed in any one of Claim 1 to Claim 3 inclusive, including tamping the drill hole proximate its mouth.
5. A method as claimed in any one of Claim 1 to Claim 4 inclusive in which said relatively low level is spatially adjacent a bottom of the drill hole and
10 spaced above the bottom by a predetermined distance.
6. A method as claimed in Claim 5 in which the spacing between said relatively low level and the bottom is between about 0,5 m and about 3 m.
- 15 7. A method as claimed in Claim 5 or Claim 6, including supporting in each respective case the layer of plunger material and the layer of blasting substance on a plug capable of being positioned in the drill hole at a predetermined level.
- 20 8. A method as claimed in any one of Claim 5 to Claim 7 inclusive, including providing plunger material below the lower layer of blasting substance to provide a lower composite layer, providing plunger material above the higher layer of blasting substance to provide a higher composite layer, and providing one or more further composite layers of blasting substance and plunger material
25 in the drill hole, with spacings in-between, in series along the drill hole.
9. A method as claimed in any one of Claim 1 to Claim 4 inclusive, in which the lower layer of blasting substance is positioned proximate and is supported on the bottom of the drill hole.
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10. A method as claimed in any one of Claim 1 to Claim 9 inclusive which includes actuating the initiators at time intervals to initiate the respective blasting substances simultaneously.

5 11. A method as claimed in Claim 10 which includes actuating the initiators in a way selected from electrically, electronically, or pyrotechnically.

12. A method of mining including carrying out the method of any one of Claim 1 to Claim 11 on each of an array of drill holes.

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13. A charged drill hole extending between a mouth thereof at a surface, and a blind end or bottom thereof remote from the mouth, including within the drill hole,

15 a lower layer of a blasting substance at a relatively low level toward said bottom, and a lower layer of a plunger material proximately above the lower layer of blasting substance;

20 a higher layer of a plunger material at a relatively high level remote from said bottom, and spaced a predetermined distance above said lower layer of plunger material such as to form a spacing therebetween, and proximately above said higher layer of plunger material, a higher layer of a blasting substance;

initiators placed in association with the respective layers of blasting substances and having connectors for connection to a controller for actuating the initiators at predetermined time intervals,

25 an arrangement being provided wherein the lower and higher layers of plunger material oppose each other spatially, each layer of plunger material being backed by a layer of blasting substance, such that, in use, on actuation of the layers of blasting substance the layers of plunger material are propelled toward each other, to impinge upon each other and to convert kinetic energy

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associated with the propelled layers of plunger material into pressure or shock waves to destruct surrounding material.

14. A charged drill hole as claimed in Claim 13 in which the spacing
5 between opposing surfaces of respectively said lower layer and said higher layer of plunger material is between about 0,5 m and about 3 m.

15. A charged drill hole as claimed in Claim 13 or Claim 14 in which the respective layers of plunger material are flowable material allowing
10 placement in the drill hole at the respective desired positions.

16. A charged drill hole as claimed in any one of Claim 13 to Claim 15 inclusive, including tamping material closing the drill hole proximate its mouth.

15 17. A charged drill hole as claimed in any one of Claim 13 to Claim 16 inclusive in which said relatively low level is spatially adjacent a bottom of the drill hole and spaced above the bottom by a predetermined distance:

18. A charged drill hole as claimed in Claim 17 in which the spacing is
20 between about 0,5 m and about 3 m.

19. A charged drill hole as claimed in Claim 17 or Claim 18 in which, in each respective case, the layer of plunger material and the layer of blasting substance is supported on a plug positioned in the drill hole at a predetermined
25 level.

20. A charged drill hole as claimed in any one of Claim 17 to Claim 19 inclusive, including plunger material provided below the lower layer of blasting substance to form a lower composite layer, plunger material provided above the
30 higher layer of blasting substance to form a higher composite layer, and one or

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more further composite layers of blasting substance and plunger material, with spacings in-between, in series along the drill hole.

5 21. A charged drill hole as claimed in any one of Claim 13 to Claim 16 inclusive, in which the lower layer of blasting substance is proximate the bottom and is supported on the bottom.

10 22. A blasting operation including an array of blast holes each in accordance with any one of Claim 13 to Claim 21 inclusive.